REMARKS

INTRODUCTION:

In accordance with the foregoing, claims 1 and 3-11 have been amended, and claim 2 has been cancelled without prejudice or disclaimer. No new matter is being presented, and approval and entry are respectfully requested.

Claims 1 and 3-11 are pending and under consideration. Reconsideration is respectfully requested.

CORRECTION OF TYPOGRAPHICAL ERRORS AND PLACING CLAIMS IN BETTER FORM:

Claims 3-5 and 7-11 have been amended to put the claims into better form.

DOUBLE PATENTING:

On page 2 of the Office Action, claims 1-11 were rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-9 of USPN 6,764,556.

Independent claim 1 has been amended include the features of claim 2, which has been cancelled without prejudice or disclaimer, so that amended claim 1 recites:

> A copper-nickel-silicon quench substrate <u>of a thermally conducting alloy</u> for rapid solidification of molten alloy into strip, <u>the substrate</u> having a two-phase microstructure with cells of copper rich regions surrounded intimately by a discontinuous network of nickel silicide and chromium silicide phases<u>,</u>
> <u>wherein said thermally conducting alloy is a copper-nickel silicon alloy consisting essentially of about 6-8 wt % nickel, about 1-2 wt % silicon, about 0.3-0.8 wt % chromium, the balance being copper and incidental impurities</u>.

For clarity, independent claim 6 has been amended to recite, in part: "heat treating said substrate to obtain a two-phase microstructure having a cell size ranging from about 1-1000 µm, said heat treating being carried out at a temperature ranging from about 440 to 955 °C[[.;]]<u>,</u> <u>wherein the two-phase microstructure has cells of copper rich regions surrounded intimately by a discontinuous network of nickel silicide and chromium silicide phases</u>."

It is respectfully submitted that the thermally conducting alloy of the quench substrate in amended claim 1 of the present invention, and the thermally conducting alloy of the quench substrate produced via the process of claim 6 of the present invention, are different from the thermally conducting alloy the quench subtrate of USPN 6,764,556. Five key features appear in each of the quench substrate alloy of the present invention and the quench substrate alloy of USPN 6,764,556:

1. The elements, and their recommended concentrations, added to copper to create the copper alloy system (Ni, Si, Other)

2. A description of how a part of the specified composition is fabricated (Fabrication Technique);
3. The hard phases that give the copper alloy its distinctive mechanical properties (Hard Phases);
4. The process by which the hard phases are sized and/or distributed throughout the copper alloy matrix to achieve the desirable mechanical properties (Strengthening Mechanism), and;
5. The specific mechanical properties that make each copper alloy distinctive and useful in specific applications (Key Mechanical Property).

The five key features are compared in the two attached tables. Table I compares Ni, Si, Other and Fabrication Technique. Table II compares Hard Phases, Strengthening Mechanism and Key Mechanical Property. From these tables, the copper-based alloys are differentiated.

Table I

Reference	Ni	Si	Other	Fabrication Technique
10/644,220	6-8	1-2	0.3-0.8 Cr	Cast + Mechanical Deformation + Heat Treatment
USPN 6,764,556	6-8	1-2	0.3-0.8 Cr	Cast + Mechanical Deformation + Heat Treatment

Table II (see below) is submitted to show more clearly differences between the quence substrate alloy of the present claimed invention and the quench substrate alloy of the invention of USPN 6,764,556:

Table II

Reference	Hard Phase(s)	Strengthening Mechanism	Key Mechanical Property
10/644,220	Discontinuous network of Ni-silicide + Cr-silicide particles on grain boundaries (see independent claims 1 and 6)	Heat Treatment (Solutionize + Precipitation Harden)	Resistance to weld induced thermal fatigue during continuous casting (more effective than in USPN 6,764,566)
USPN 6,764,556	Network of Ni-silicide particles on grain boundaries	Heat Treatment (Solutionize + Precipitation Harden)	Resistance to weld induced thermal fatigue during continuous casting

That is, while the strengthening mechanism of the alloy of 10/644,220 are substantially similar to the strengthening mechanisms of USPN 6,764,556, the Hard Phases are different. USPN 6,764,556 discloses one primary hard phase located at the grain boundaries. By contrast, the present invention (Ser. No. 10/644,220) describes two distinct hardening phases discontinuously arranged at the grain boundaries. The structural difference between structure of the quench substrate alloy of the present invention (see claim 1, and produced by the process of claim 6) and the structure of the quench substrate alloy of USPN 6,764,556 is made possible by the specifically cited fabrication processes of the present invention, which provide a discontinuous network of Ni-silicide and Cr-silicide particles on grain boundaries. The quench substrate alloy of claim 1, and the quench substrate alloy produced by the process of claim 6 of the present claimed invention, have a structure with two distinct hardening phases discontinuously arranged at the grain boundaries, which yield more effective Key Mechanical Properties than the structure of the quench substrate alloy of USPN 6,764,556.

Thus, it is respectfully submitted that independent claims 1 and 6 of the present invention are patentably distinct from claims 1-9 of USPN 6,764,556 and are non-obvious in view of claims 1-9 of USPN 6,764,556. Since claims 2-5 and 7-11 depend from claims 1 and 6, claims 2-5 and 7-11 are distinct from, and non-obvious in view of, claims 1-9 of USPN 6,764,556 for at least the reasons claims 1 and 6 are distinct from, and non-obvious in view of, claims 1-9 of USPN 6,764,556. Hence, it is respectfully submitted that no terminal disclaimer is necessary.

REJECTION UNDER 35 U.S.C. §102:

In the Office Action, at page 3, claim 1 was rejected under 35 U.S.C. §102(b) as being clearly anticipated by Popa et al. (PTO-1449, AM, paragraph bridging pages 697-698, especially paragraph from top-left of 698; hereafter, Popa). This rejection is traversed and reconsideration is requested.

Claim 1 has been amended to include the features of claim 2. Claim 2 has been cancelled without prejudice or disclaimer.

It is respectfully submitted that the court has held that an anticipating reference "must disclose every element of the challenged claim and enable one skilled in the art to make the anticipating subject matter." PPG Industries, Inc. v. Guardian Industries Corp., 75 F.3d 1558, 1566, 37 USPQ2d 1618, 1624 (Fed. Cir. 1996).

Table III (see below) reveals that the Popa alloy contains only 3.75 wt% Ni, while the present invention contains 6 to 8 wt% Ni. The higher Ni content of the present invention provides

for more hard Ni-silicide particles and a stronger copper matrix. The lower Ni content of the Popa alloy may be partially compensated for by the addition of Ti and Zr.

Table III

Reference	Ni	Si	Other	Fabrication Technique
10/644,220	6-8	1-2	0.3-0.8 Cr	Cast + Mechanical Deformation + Heat Treatment
Popa et. al.	3.75	0.9	0-0.6 Cr 0-0.02 Zr 0-0.27 Ti	Cast + Mechanical Deformation + Heat Treatment

As shown in Table IV (see below), the present invention and Popa target very different Key Mechanical Properties for very different end-uses. The present invention cites excellent resistance to weld-induced thermal fatigue, a characteristic needed to maintain a consistent surface on a rotating substrate used for amorphous metal strip casting. In contrast, Popa targets vibrating molds in continuous casting of steel, wherein the primary erosion mechanism is abrasion from contact friction.

Table IV

Reference	Hard Phase(s)	Strengthening Mechanism	Key Mechanical Property
10/644,220	Discontinuous network of Ni-silicide + Cr-silicide particles on grain boundaries	Heat Treatment (Solutionize + Precipitation Harden)	Resistance to weld induced thermal fatigue during continuous casting (better than in 6,64,566)
Popa et. al.	Ni-silicide + Cr-silicide	Heat Treatment (Solutionize + Precipitation Harden)	Resistance to abrasion during continuous casting HT strength

Hence, it is respectfully submitted that every element of claim 1 of the present invention is not disclosed by Popa et al. (PTO-1449, AM, paragraph bridging pages 697-698, especially paragraph from top-left of 698), and that claim 1 is not anticipated under 35 U.S.C. §102(b) by Popa et al. (PTO-1449, AM, paragraph bridging pages 697-698, especially paragraph from top-left of 698).

REJECTION UNDER 35 U.S.C. §103:

In the Office Action, at pages 3-4, claims 2-3 were rejected under 35 U.S.C. §103(a) as being unpatentable over Popa et al. (PTO-1449, AM; hereafter, Popa) as applied to claim 1 above, and further in view of Mori et al. (USPN 4,818,307; hereafter, Mori). The reasons for the rejection are set forth in the Office Action and therefore not repeated. The rejection is traversed and reconsideration is requested.

Claim 1 has been amended to include the features of claim 2. Claim 2 has been cancelled without prejudice or disclaimer. Hence, the rejection of claim 2 under 35 U.S.C. §103(a) over Popa et al. (PTO-1449, AM) as applied to claim 1 above, and further in view of Mori et al. (USPN 4,818,307) is now moot.

Claim 3 of the present invention depends from claim 1. Hence, the features of claim 3 include the features of claim 1.

It is respectfully submitted that the copper-based alloy system of Mori requires the presence of B and Fe (the present invention does not) and does not require Cr (the present invention does). As described in Table IV below, these chemical differences yield very different Hard Phases and Strengthening Mechanisms.

Table V

Reference	Hard Phase(s)	Strengthening Mechanism	Key Mechanical Property
10/644,220	Discontinuous network of Ni-silicide + Cr-silicide particles on grain boundaries	Heat Treatment (Solutionize + Precipitation Harden)	Resistance to weld induced thermal fatigue during continuous casting (better than in 6,64,566)
Popa et. al.	Ni-silicide + Cr-silicide	Heat Treatment (Solutionize + Precipitation Harden)	Resistance to abrasion during continuous casting HT strength
USPN 4,818,307 (Mori)	Fe,Ni-silicide Fe,Ni-boride Cr,Ti-carbide	Dispersion Strengthen	Resistance to abrasion

In addition, the alloy system of Mori can only be produced as a functional part by thermally depositing a layer of the alloy onto a metallic substrate (Fabrication Technique in Table VI: see below). Thus, the material of Mori is used on a hard surface on a metallic part rather than as a monolithic part in itself. It is respectfully submitted that it is known to those skilled in the art that all known rotating substrates for amorphous metal strip casting have been monolithic.

Table VI

Reference	Ni	Si	Other	Fabrication Technique
10/644,220	6-8	1-2	0.3-0.8 Cr	Cast + Mechanical Deformation + Heat Treatment
Popa et. al.	3.75	0.9	0-0.6 Cr 0-0.02 Zr 0-0.27 Ti	Cast + Mechanical Deformation + Heat Treatment
USPN 4,818,307 (Mori)	5-30	1-5	0.5-3 B 4-30 Fe *0-5 Ti* *0-10 Mn* *0-2 C* *0-10 Cr*	Copper alloy powder containing dispersed silicides, borides and carbides thermally deposited on a metallic base

Like Popa et al., Mori targets applications in abrasion resistance. Again, this is different from the resistance to weld induced thermal fatigue needed in rotating substrates for amorphous metal strip casting that is obtained in the present claimed invention.

Thus, it is respectfully submitted that Popa et al. (PTO-1449, AM), even if combined with Mori et al. (USPN 4,818,307), does not disclose or suggest claim 1 of the present invention. Hence, claim 1 is submitted to be patentable under 35 U.S.C. §103(a) over Popa et al. (PTO-1449, AM) as applied to claim 1 above, and further in view of Mori et al. (USPN 4,818,307). Since claim 3 of the present invention depends from claim 1, claim 3 is patentable under 35 U.S.C. §103(a) over Popa et al. (PTO-1449, AM) as applied to claim 1 above, and further in view of Mori et al. (USPN 4,818,307) for at least the reasons that claim 1 is patentable under 35 U.S.C. §103(a) over Popa et al. (PTO-1449, AM) as applied to claim 1 above, and further in view of Mori et al. (USPN 4,818,307).

CONCLUSION:

In accordance with the foregoing, it is respectfully submitted that all outstanding objections and rejections have been overcome and/or rendered moot, and further, that all pending claims patentably distinguish over the prior art. Thus, there being no further outstanding objections or rejections, the application is submitted as being in condition for allowance which action is earnestly solicited.

If the Examiner has any remaining issues to be addressed, it is believed that prosecution can be expedited by the Examiner contacting the undersigned attorney for a telephone interview to discuss resolution of such issues.

If there are any underpayments or overpayments of fees associated with the filing of this Amendment, please charge and/or credit the same to our Deposit Account No. 19-3935.

Respectfully submitted,

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